REMARKS

The Office Action dated April 30, 2004 has been received and carefully noted. The above amendments to the claims, and the following remarks, are submitted as a full and complete response thereto. No new matter has been entered. Claims 23-38 and 40-49 are pending in the instant application and have been examined.

Applicants note that the PTOL-326 coversheet still lists claims 1-22 as still pending, although those claims have been previously cancelled. Appropriate correction in the next communication from the Office is respectfully requested.

In the Office Action, claims 23-38, 40-43 and 46-49 were rejected under 35 U.S.C. §112, second paragraph, as being indefinite. The grounds of rejection for claims 23 and 46-49 were the same, namely that the recitation of "said input different digital signals" lacks antecedent basis. As amended herein, the limitation "input" has been removed from claims 23 and 46-49, where Applicants note that such changes do not further limit the scopes of the claims. Claim 33 was also rejected because it was alleged that the limitation "the composite signal" lacked proper antecedent basis. Applicants have amended claim 33 to change the limitation to "the composite analog signal," so that the limitation will have a proper antecedent basis. Applicants respectfully assert that the rejections under 35 U.S.C. §112, second paragraph, are now moot and should be withdrawn.

Additionally, claims 23-25, 28-31, 33, 37, 38, 40, 42-45, 47 were rejected under 35 U.S.C. § 102(b) as being anticipated by *Carney et al.* (U.S. Patent No. 5,937,011).

Claims 23-27, 29-38 and 40-49 have been rejected under 35 U.S.C. § 103(a) as being unpatentable over *Helms* (U.S. Patent Pub. 2001/0014592) in view of *Carney et al.* the above rejections are respectfully traversed based on the comments that follow.

The present invention is directed, according to claim 23, to a multi frequency carrier transmitter. The transmitter includes input means for receiving a plurality of different digital signals to be transmitted, the different digital signals to be transmitted on different carrier frequencies, digital modulators for modulating the different digital signal at the respective frequencies, digital to analog converter means for converting a composite digital signal comprising the different digital signals at the respective carrier frequencies to analog form, thereby generating a composite analog signal, amplifier means for receiving and amplifying the composite analog signal and predistortion means for predistorting the plurality of different digital signals during or after modulation of the different digital signals by the digital modulators and prior to amplification of the composite analog signal by the amplifier means. The predistortion provided by the predistortion means is subsequently altered in dependence on differences between each of the different digital signals and the output at the amplifier means.

The present invention is directed, according to claim 44, to a multi carrier frequency transmission method. The steps of the method include receiving a plurality of different digital signals to be transmitted, the different signals to be transmitted on different carrier frequencies, modulating the different digital signals at the respective frequencies, combining the plurality of different digital signals to provide a composite

digital signal comprising the different digital signals at the respective carrier frequencies, converting the composite digital signal to analog form, thereby generating a composite analog signal and amplifying the composite analog signal. The method further includes predistorting the plurality of different digital signals prior to amplification of the composite analog signal by the amplification means during or after the modulation step and altering the predistortion applied to subsequent digital signals in dependence on the difference between each of the different digital signals and the amplified signal.

The present invention is directed, according to claim 45, to a multi frequency carrier transmitter. The transmitter includes input means for receiving a plurality of different digital signals to be transmitted, the different digital signals to be transmitted on different carrier frequencies, digital modulators for modulating the different digital signals at the respective frequencies and combining means for receiving the different digital signals modulated at the respective frequencies to generate a composite digital signal. The transmitter also includes digital to analog converter means for converting the composite digital signal to analog form, generating a composite analog signal, amplifier means for receiving the composite analog signal and amplifying the composite analog signal and predistortion means for predistorting the plurality of digital signals during or after modulation of the different digital signals by the digital modulators and prior to combination of the different digital signals by the combining means, the predistortion provided by the predistortion means being subsequently altered in dependence on a

difference between each of the input different digital signals and an output at the amplifier means.

The present invention is directed, according to claim 46, to a multi frequency carrier transmitter. The transmitter includes input means for receiving a plurality of different digital signals to be transmitted, the different digital signals to be transmitted on different carrier frequencies, digital modulators for modulating the different digital signals at the respective frequencies, digital to analog converter means for converting a composite digital signal comprising the different digital signals at the respective carrier frequencies to analog form, generating a composite analog signal and amplifier means for receiving and amplifying the composite analog signal. The transmitter also includes predistortion means for predistorting the plurality of digital signals during or after modulation of the different digital signals by the digital modulators and prior to amplification of the composite digital signal by the amplifier means, the predistortion provided by a the predistortion means being subsequently altered in dependence on a difference between each of the input different digital signals and a plurality of different digital sample signals. The transmitter also includes analog to digital conversion means for converting a sample of the output of the amplifier means into digital form to generate a composite digital sample signal and chanelizing means for converting the composite digital sample signal into the plurality of different digital sample signals.

The present invention is directed, according to claim 47, to a multi frequency carrier transmitter. The transmitter includes an input for receiving a plurality of different

digital signals to be transmitted, the different digital signals to be transmitted on different carrier frequencies, a plurality of digital modulators for modulating the different digital signal at the respective frequencies, a digital to analog converter for converting a composite digital signal comprising the different digital signals at the respective carrier frequencies to analog form, generating a composite analog signal, an amplifier for receiving and amplifying the composite analog signal and a predistorter for predistorting the plurality of different digital signals during or after modulation of the different digital signals by the digital modulators and prior to amplification of the composite digital signal by the amplifier, the predistortion provided by the predistorter being subsequently altered in dependence on a difference between each of the different digital signals and the output at the amplifier.

The present invention is directed, according to claim 48, to a multi frequency carrier transmitter. The transmitter includes an input for receiving a plurality of different digital signals to be transmitted, the different digital signals to be transmitted on different carrier frequencies, a plurality of digital modulators for modulating the different digital signals at the respective frequencies, a combiner for receiving the different digital signals modulated at the respective frequencies to generate a composite digital signal and a digital to analog converter for converting the composite digital signal to analog form, generating a composite analog signal. The transmitter includes an amplifier for receiving the composite analog signal and amplifying the composite analog signal and a predistorter for predistorting the plurality of different digital signals during or after

modulation of the different signals by the digital modulators and prior to combination of the different digital signals by the combiner, the predistortion provided by the predistorter being subsequently altered in dependence on a difference between the each of different digital signals and an output at the amplifier.

The present invention is directed, according to claim 49, to a multi frequency carrier transmitter. The transmitter includes an input for receiving a plurality of different digital signals to be transmitted, the different digital signals to be transmitted on different carrier frequencies, a plurality of digital modulators for modulating the different digital signals at the respective frequencies, a digital to analog converter for converting a composite digital signal comprising the different digital signals at the respective carrier frequencies to analog form, generating a composite analog signal, an amplifier for receiving and amplifying the composite analog signal, a predistorter for predistorting the plurality of different digital signals during or after modulation of the different digital signals by the digital modulators and prior to amplification of the composite digital signal by the amplifier, the predistortion provided by a the predistorter being subsequently altered in dependence on a difference between each of the input different digital signals and a plurality of different digital sample signals, an analog to digital converter for converting a sample of the output of the amplifier into digital form to generate a composite digital sample signal and a chanelizer for converting the composite digital sample signal into the plurality of different digital sample signals.

Generally, the present invention provides a transmitter which predistorts individual digital signals which have been or are being modulated in the digital domain. The fact that the distortion is performed on the different digital signals requires that the predistortion is performed prior to combination of the different digital signals to generate a composite digital signal which may then be converted to a composite analog signal by a digital to analog converter, which in turn may then be amplified.

With respect to the cited prior art, *Carney et al.* and *Helms*, Applicants note that this art was previously cited in the prior Office Action, and thus its discussion need not be repeated. Applicants respectfully assert that the present invention, as claimed in independent claims 23 and 44-49, is neither taught nor suggested by the cited prior art.

In *Carney et al.,* the digital combiner 122 is disclosed to combine the plurality of modulated signals 120-1, 120-2, . . . 120-n. The composite signal is then input into the predistorting means 14 together with the HPA (High Power Amplifier) feedback signal. The predistortion processor then performs a first crude amplitude correction by finding the differences between the HPA feedback signal and the composite signal. Subsequent distortion correction procedures are then required which involve resampling the HPA response.

Applicants respectfully assert that *Carney et al.* fails to teach or suggest the altering the predistortion in dependence on a difference between each of the different digital signals and the output at the amplifier means. Claim 23 recites, in part, "said predistortion provided by said predistortion means being subsequently altered in

dependence on differences between each of said different digital signals and the output at said amplifier means," with independent claims 44-49 reciting similar subject matter. As discussed above, this aspect of the invention is neither taught nor suggested by the cited prior art, as discussed below. Thus, reconsideration and withdrawal of the rejections applying *Carney et al.* are respectfully requested.

In the present invention, each of the individual signals are input into the predistorter and the difference between each of the input signals and the output signal can be calculated. This allows the predistortion coefficients to be calculated based on each of the different carrier frequencies, thus allowing the predistortion to be individually tailored for each specific signal, to better compensate for any distortion occurring in the amplifier, without the need for subsequent correction procedures, as disclosed in *Carney et al.* Thus, Applicants additionally assert that one of ordinary skill would have no reason to modify *Carney et al.* to reach the claims of the instant application and thus, those claims are respectfully asserted to also not be obvious in view of *Carney et al.*

With respect to the rejection that also applies *Helms*, the Office appears to have accepted that the carrier related signals in_1, in_2, . . . , in_n, are already modulated before being input into the predistortion unit PDD, as Applicants previously asserted. However, in the latest rejections, the Office appears to allege that it would have been obvious to one of ordinary skill in the art to modulate those carrier related input signals prior to being input into the predistortion unit, using individual modulating means, as disclosed in *Carney et al.* As discussed below, Applicants respectfully traverse this allegation.

Helms already discloses a modulating means in the form of digital upward conversion units DUC which "perform a shift to a digital intermediate frequency IF" (paragraph [0031]). Thus, there is no need for the modulating means, disclosed in *Carney et al.*, to be incorporated into *Helms*. In other words, one of ordinary skill in the art would not have been motivated to combine the modulators of *Carney et al.* with the apparatus of *Helms* because there would be no need for the additional modulating means. Thus, Applicants respectfully assert that the obviousness-type rejection applying *Carney et al.* and *Helms* is improper to failing to proffer adequate motivation to combine the references.

In addition, *Carney et al.* teaches away from performing predistortion prior to the combination of signals. *Helms* teaches away from performing predistortion during or after modulation of an input signal as disclosed in the present invention. A prior art reference "must be considered in its entirety, i.e., as a whole, including portions that would lead away from the invention in suit", *Panduit Corp. v. Dennison Mfg. Co* ., 810 F.2d 1561, 1568 [1 USPQ 1593, 1597] (Fed. Cir. 1987). Given the inverse teachings of each of the references with respect to the combination, for this additional reason, Applicants respectfully assert that the obviousness-type rejection applying *Carney et al.* and *Helms* is improper to failing to proffer adequate motivation to combine the references.

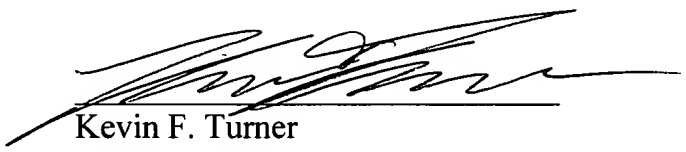
Consequently, neither *Carney et al.* nor *Helms* teaches or suggests the present invention for at least the reasons given above. As such, Applicants respectfully assert

that the rejections of claims 23 and 44-49 are improper for failing to teach or suggest all of the elements of those claims. Similarly, claims 24-38 and 40-43 should be allowed over the prior art of record for at least the dependence of those claims on claim 23. Thus, Applicants respectfully assert that the application is in condition for allowance and that the application should be allowed to proceed to issue.

If for any reason the Examiner determines that the application is not now in condition for allowance, it is respectfully requested that the Examiner contact, by telephone, the applicant's undersigned attorney at the indicated telephone number to arrange for an interview to expedite the disposition of this application.

In the event this paper is not being timely filed, the applicant respectfully petitions for an appropriate extension of time. Any fees for such an extension together with any additional fees may be charged to Counsel's Deposit Account 50-2222.

Respectfully submitted,



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Enclosure: Petition for Extension Time (1-month)